MTH 255 **HW #6** Winter 2012

1. Let S be the part of the paraboloid $2x^2 + 2y^2 + z = 50$ which lies above the xy-plane. Assume x, y, and z are measured in millimeters. Suppose S is coated with chocolate, and that the density of chocolate is $\sigma = x^2 + y^2$ milligrams per square millimeter. How much total chocolate is there?

2. Suppose $\vec{\nabla} \cdot \vec{\boldsymbol{F}} = xyz^2$.

(a) Find $\vec{\nabla} \cdot \vec{\boldsymbol{F}}$ at the point $(1, 2, 1)$.
Note: You are given $\vec{\nabla} \cdot \vec{\boldsymbol{F}}$, not $\vec{\boldsymbol{F}}$!

(b) Using your answer to part (a), but no other information about the vector field $\vec{\boldsymbol{F}}$, estimate the flux out of a small box of side 0.2 centered at the point $(1, 2, 1)$ and with edges parallel to the axes.

(c) Without computing the vector field $\vec{\boldsymbol{F}}$, calculate the exact flux out of the box.